ULTRAVIOLET PHOTOMETRY OF R CRB AND RY SGR

Final Technical Report

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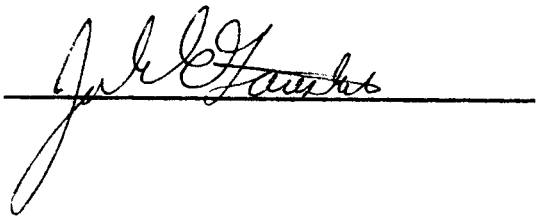
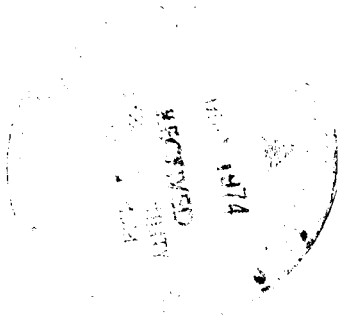
Principal Investigator: John E. Gaustad
Associate Professor of Astronomy
Department of Astronomy
University of California
Berkeley, California 94720



September 18, 1973



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This project was a Guest Observer Experiment on the Orbiting Astronomical Observatory Program (OAO-A2). It was proposed that ultraviolet photometry be obtained of the stars R CrB and RY Sgr with both the Smithsonian Astrophysical Observatory telescope instrument and with the Wisconsin Experiment Package.

The two stars mentioned are of the class of hydrogen-poor, carbon-rich stars, which undergo irregular light variations thought to be due to condensation of a dust shell around the star. It is thought that the composition of this dust is graphite, which should be identifiable by its ultraviolet extinction curve. It was hoped that a time sequence of photometric observations could be obtained, from which the dynamic development of the dust shell could be determined. Supporting programs of ground-based observations were planned, including photometry at visual wavelengths, spectral scanning to determine the visual and near-infrared extinction curve, and infrared photometry to measure any changes in the circumstellar shell.

Most of the objectives of this program were not achieved. According to a letter (February 15, 1972) from R. J. Davis of the Smithsonian Astrophysical Observatory, no telescope observations of these stars were made. The Wisconsin Experiment Package photometers were used on R CrB only once, On May 15, 1969. The data were sent to us on June 16, 1971, by Dr. Arthur D. Code of the University of Wisconsin. No observations of RY Sgr were obtained with the Wisconsin instrument.

I have examined the data sent to me by Dr. Code and concur with his analysis, that the star does not show any significant ultraviolet intensity, nor is there any evidence for an absorption by graphite. Unfortunately, the data at very short wavelengths are highly uncertain due to a possible

"red leak" condition. Therefore no significant conclusion about the presence of graphite, the original aim of the proposal, can be drawn from these data. The data at longer wavelengths may be useful at some future time for comparison with model atmosphere calculations. By themselves, however, those observations are not substantial enough to warrant their publication.

Some effort was expended on ground-based observations in the expectation of obtaining more substantial satellite measurements. We made photometric observations (in the U,B,V,R, and I bands) of all the bright R CrB stars in the northern hemisphere to serve as a baseline for monitoring future observations. We made scanner observations of R CrB around the time we expected to observe it with the satellite. We have made a few photometric observations in the infrared as well, and developed plans for polarimetric measurements. Some of this data has been useful in planning other programs. For example, during the course of this work, it was discovered that the R CrB star V482 Cygni is a triple system. When sufficient spectroscopic data have been accumulated, it should be possible to determine the absolute magnitude of the primary star, an important quality for the evolutionary theory of these objects. However, the optical data obtained under the OAO program are again not substantial enough to merit independent publication. Should the data be incorporated in later work on these stars, support of NASA in the data procurement will be acknowledged.